Patent Application of

Rashad N. Scarborough

for

TITLE: LEVER ENHANCED PEDALING SYSTEM

BACKGROUND OF THE INVENTION--FIELD OF INVENTION

This invention relates to bicycles possessing a propulsion system composed of lever machines.

BACKGROUND OF THE INVENTION--PRIOR ART

In the bicycle industry there are a multitude of pedal propulsion systems that offer a wide variety of commuting benefits for the bicyclist. Notably, these are pedaling systems that provide multi speed human powered propulsion that allows the rider to pedal with little effort up an incline and increase in speed efficiently.

Currently, the prevalent configuration of bicycles in the market place have a rotary pedaling system that utilizes two pedals, pivotally connected to a rigid assembly of two crank

arms and a crank sprocket. Furthermore, these two crank arms mounted to a crank sprocket engage a transmission chain for engaging the rear sprocket of the rear wheel. These pedaling systems vary from multi speed to single speed, but their mechanical nature restricts their frame design to century old principle structures; which is the need for a bicycle frame to suspends the crank shaft between the front and rear wheels. Furthermore, although these rotary systems utilize crank sprockets in the form of the wheel and axel machine, they cannot have more mechanical advantage than the lever machine, because the fulcrum or shaft of the crank arms is usually positioned close to the level of axels belonging to the bicycles transport providing wheels. This level restricts the length of the crank arms which acts as levers on the wheel and axel because of its proximity to the ground. However, a lever machine usually amplifies the spreading of propulsion effort along a longer distance and has movements concentrated to pivotal swings instead of a one direction rotational path. Thus, being significantly free from the vertical restrictions of the ground and the riders range of motion. Because, this effort to move a transport load is spread over a much longer distance using a lever arm than the crank arm, a rider pedaling with levers will have lesser effort pedaling a bicycle.

There have been a myriad of bicycle inventions exploiting the mechanical advantage of the lever machine. U.S. patent 4,666,173 to Graham (1987) discloses a bicycle having a lever configured pedaling system, with fulcrums positioned behind the rear wheel axel and lever arms extending between the bicycle's transport providing wheels; however, the illustrated lever arms cannot possibly provide sound pedaling efficiency as discovered by my observation of similar lever arms built and applied to a two wheeled vehicle frame. My experimentation with such levers having a pivotal pedal that extended outwardly from the frontal outer wall of each lever yielded evidence of the right lever twisting clockwise when applying downward force on its pedal and the left lever twisting counter clockwise when applying downward force on its pedal. Looking at the shape of the levers as illustrated in the patent application (4,666,173) (FIG. 3), the levers 48 and 50 have the potential for twisting in a like manner, like the similar levers conducted in my experiment. The invention also utilizes an indirect transmission means from the lever to the sprocket of the rear wheel, however, the lever enhanced pedaling system uses a direct transmission means from it levers to the sprockets of the rear wheel. As illustrated in patent application 4,666,173 the first transmission chain from the lever is a shaft arm and ratchet for moving the pedal sprocket above the rear wheel in one direction. The second transmission means is a chain connected to the pedal sprocket to the rear wheel sprocket. The lever enhanced pedaling system (L.E.P.S.) skips over the extra weight of an indirect

transmission means allowing designers using this system to produce a more aero dynamic, less bulky and more efficient bicycle.

Two inventions utilizing the advantages of the lever machine is U.S. patent 4,666,174 to Efros (1987) and U.S. patent 5,335,927 to Islas (1994). These inventions are composed of a bicycle having a lever configured pedaling system, with fulcrums positioned in front of the rear wheel axel providing lever ends with the ability to pivot below the bicycles mid-frame portion. These lever pedaling system have a lesser mechanical advantage than the lever enhanced pedaling system (L.E.P.S.), because their levers are shorter in length and thus the effort needed to propel the rider is spread out in a shorter distance from the applied force of the riders foot to the fulcrum. The lever enhanced pedaling system has a principle configuration which allows the fulcrums to be behind the axel of the rear wheel while its levers are extended from that pivotal area to the area between the vehicle's two wheels. Thus, its lever machines are longer in length than the lever machines in patent applications 4,666,174 and 5,335,927 which gives the lever enhance pedaling system a greater mechanical advantage.

As mention before, the current standard mechanical configuration of bicycles, which has been around since the 19th century, restricts their frame design to having a bicycle frame that suspends the crank shaft between the front and rear wheels. This frame design is usually triangular and tubular, like the U.S patent 5,405,157 to Bezerra (1995). The fulcrum of the lever machines in this patent application is suspended by the frame of the bicycle between the front and rear wheels. Patent 4,857,035 to Anderson (1989) also has a triangular tubular structure and besides it having a lesser mechanical advantage than the L.E.P.S., because its' lever is shorter in length, much of its complex mechanical configuration is exposed, allowing its mechanical components to diminish the beauty of the frames form. The mechanical configuration of the L.E.P.S. allows for a frame structure that conceals much of its' mechanical interactions between its' levers, transmission chains and rear wheel sprockets, thus adding more stream line appeal to the bicycle and more marketability.

BACKGROUND OF INVENTION—OBJECTS AND ADVANTAGES

Notably, besides the objects and advantages of the lever enhanced pedaling system described in my above patent, several objects and advantages of the present invention are:

(a) to provide a bicycle enabling its levers to efficiently reciprocate for quality pedaling propulsion and allowing them to be suspended above ground by the use of high strength chains fastened to a common shaft within the frame of the bicycle;

(b) to provide beam reinforced tubular levers that safely support the weight of a healthy bicyclist;

(c) to provide a lever enhanced propelled bicycle that is free from the triangular and tubular structured frames of conventional bicycles;

(d) to provide a lever pedaling bicycle offering less effort to propel the rider to longer distances per downward pedal;

Further objects and advantages are to provide an enhanced lever pedaling bicycle free from the suspension of a crank set between its two wheels, thus allowing bicycle designers more room for creativity in frame design. Still further, advantages will become apparent from a consideration of the ensuing description and drawings.

SUMMARY

In accordance with the present invention the lever enhanced pedaling system for bicycles comprises a pedaling system enabling little effort needed to propel the vehicle and a vehicle with a principle configuration allowing the absence of a vertically open through structure or tubular triangular frame, or any portion of the bicycles' frame in the area between the vehicles two wheels or horizontally adjacent to that area.

DRAWING--Figures

Fig. 1 shows a test model built for pedaling propulsion performance and marketability..

Fig. 2 shows exposes the right side preferred mechanical configuration of the lever enhanced pedaling bicycle and how their components are engaged to work with one another.

Fig. 3 shows a right side enlarged breakaway mechanical configuration of the transmission chains, lever, the rotational path of the propulsion load and force applied to move propulsion load.

Fig. 4 shows the rear view of the lever enhanced pedaling bicycle.

Fig 5 to 6 shows animated views of the reverse lever and how its member components reacts to its manual rotation for freeing the sprockets of the rear wheel for reverse movement.

DRAWING--REFERENCE NUMERALS

2 front wheel

4 bicycle frame

6 reciprocal cable

7 break cable pulley wheel

14 left lever

15 right lever

26 rear wheel

30 manual reverse lever

31 reverse cable pulley system

32 reverse cable

33 transmission chain

52 high strength chain-lever connector

53 high strength chain

54 chain-frame shaft connector

55 handle bar

57 seat

58 reciprocal mounting system

45 middle beam

17 slanted notch

34 rear wheel sprockets

35 reverse lever

36 pedals

37 chain travel maximizing sprocket

38 sprocket extender

40 propulsion load

42 chain guiding sprocket

44 chain guiding sprocket

46 break cable

47 fulcrum

49 spring-chain connector

50 transmission chain retracting spring

51 spring-frame connection shaft

DETAILED DESCRIPTION—FIGS. 2 TO 4

Below is a description of the mechanical configurations according to drawings illustrated in Figs 2 to 4. The lever enhanced propulsion bicycle is composed of a frame 4 with each side, apart from the stirring cylinder, being cold bent from one piece of ¼" thick Aluminum sheet and the other side likewise. Between the inner portions of these sides are two

layers of ¼" thick Aluminum sheet metal, cold bent and welded together in the "Y" shape for holding the seat post cylinder between their inner divided walls. The seat post cylinder is welded on opposite sides to the inner surface of the "Y" shaped assembly, close to where they make contact with its inner surfaces. This "Y" shaped assembly is between the outer layers of the frame, extending from the stirring cylinder and ending rearwards, where the outer layers of the frame **4** begin to slope downward. The rear inner surfaces of the frame **4** are further reinforced, perpendicularly, from their angle of division to the area beyond the slanted notch for the rear axel, with an approximate "V" shaped Aluminum plate. The plate's outer sides are formed parallel after its angle in accordance with the inner surfaces of the frame's rear portion. The plate is welded to the inner surfaces of the frame's **4** rear portion to prevent it's sides from twisting. Thus, the majority of the frames **4** body is composed of four layers of Aluminum sheet metal with upper and lower elongated edges welded together for frame durability. This form of assembly, minimizing number of small welded joints to just the stirring cylinder and seat post cylinder, allows for a durable frame since many of the angles are cold bent instead of welded together.

The front wheel **2** is fastened to the front forks and the rear wheel is fastened between the rear layers of the frame **4**. The rear wheel **26** is composed of a hub, with spokes extending to the rim and a tire around the rim. Each side of the hub has a sprocket **34** connected to it with one direction rotating ability to allow a chain member **33** of each sprocket **34** to engage its teeth and rotate it in a forward manner. Behind the slanted notches **17** in the frame for the rear axel, are two bores for the levers to accommodate a fulcrum through each surface of the frame's rear portion. Each bore accommodates a threaded 5/8" diameter bolt **47** which works as the fulcrums of the levers **(14 & 15)** for pedaling. The 5/8" diameter bolt **47** is fastened to the frame **4** with a nut. Each lever **(14 & 15)** has pivotal ability on their surface member, of the frame **4**.

According to the illustration in Figure 4 the preferred configuration of each lever is as follows: From around the fulcrum **47**, each lever extends as two plates downwardly until its form begins to curve forwardly in a parallel beam shape into its member cylinder. A third beam **45** is between the surface of these two beams. This three beam configurations are designed to act as a reinforcement to the cylinder against downward weight and impact. The cylinder is to have a groove cut in its top surface for accommodating the vertical plates that descends to a low inner surface of the cylinder. The outer surfaces of the plates are to be welded to the cylinder along the outer corners, where the plate outwardly meets the cylinder. The frontal portion of each cylinder is occupied by a beam which begins as a triangular shaped plate

vertically descending to the lower inner surface of the cylinder and then forms a beam that extends rearward into the into the cylinder. This beam is to meet the other three beams within the cylinder. It is preferred that this beam be welded to the center beam between the rear plates of the lever for better reinforcement. The triangular plate has a filleted top angle. A bore is through this triangular surfacc ccntrally with thc fillct to accommodatc a shaft as a mcans of providing the mounted pedals **36** with pivotal ability. The outer contact angles where the plate meets the cylinder are to be welded together. Based on research and the illustration in FIG 4 the rear forks of the frame are to be on center with the center of the propulsion levers and pedals. This allows for downward applied pressure that is centralized with the rear structure of the frame, which in such cases may prevent the rear frame portion from twisting or flexing inward upon each downward pedal. Each transmission chain **33** member that is fastened to its cylinder mcmbcr **40** cngagcs thc tccth of its sprockct **34** mcmbcr conncctcd to thc hub This spring and chain connector **49** is composed of a metallic cylinder being occupied from its rear opening by the transmission chain **33**. A bolt descends through the top rear surface of the cylinder through an opening in the chain and then through the lower surface of the cylinder **49**. The bolt is fastened in place by a nut. The frontal portion of the cylinder is to be occupied by the transmission chain retractor spring **50** fastened in place within the cylinder by a JB Weld resin. The frontal end of the transmission chain retractor spring is fastened in place with a bolt **54** and nut to thc innor surfacc of thc framc.

The reciprocal system that allows the cylinder ends of the propulsion levers to swing in an up and down reciprocal manner relative to one another is composed of the follow componcnts:

Each propulsion lever **(14 & 15)** has mounted to its triangular end, a pedal **36**, which enable a rider to apply downward pressure from their right foot to a right side pedal **15** and left foot to a lcft sidc pcdal **14**. Thc pcdals constitutc part of a platform, which cnablc forcc to bc effectively applied to produce reciprocal action throughout the reciprocal system.

The reverse system allows the rear wheel **26** to be moved backwards, free from the transmission chains **33**, which have limited movement. The system is composed of a manual lever **30**, a cable **32** for each rear wheel sprocket, a pulley system **31** for each cable, and one pairs of lever **35** for each system mounted to opposite inner surfaces of the frame with pivotal ability.

The manual lever **30** is composed of an assembly of two parallel linear members fixed to perpendicularly to a plate. The plate has edges that extend right and left for allowing the rider pivot (FIG. 6) the plate toward the front of the frame **4**. The frontal portion of the parallel linear members would have adjacent bores aligned with a third bore in the frame **4**. A bolt serves as a fulcrum occuping the three holes and is fastened with a nut. The flat sides of the levers **32** linear portion face outward. Two horizontal holes, opposite one another, are positioned near the edge of the plate. A cable **32** (FIG.2) runs through each hole up and around the outer edge of the lever's **30** handling portion, forming a fastened loop. The loops are to be fastened by electric wire splicers. Each cable **32** runs through the grooves of their associated pulley system **31**, which guides them to their member lever machines **35** mounted with pivotal ability to the frame **4**. The member lever machines come in sets of two. These levers are designed to remove the transmission chains **33** from the rear wheel sprockets **34**.

Operation—Figs 1,2,5 & 6

The operational manner of using the L.E.P.S. and its' mechanical reactions are unique when compared to the prior art stated in this application. After the vehicle is mounted and the rider begins to pedal, the highest elevated pedal should be depressed to initiate acceleration. What mechanical reactions occur are the following:

Each transmission chain member **33** that is associated with the pedal **36** being depressed, would directly rotate its rear wheel sprocket member forward, thus rotating the rear wheel **26** connected to it forward. If the right propulsion lever **15** was depressed, then the reciprocal cable end **6** fastened within a high strength chain-lever connector **52** would be pulled down over the pulley wheel **56** mounted within the frame of the bicycle. The opposite end of the reciprocal cable **6** fastened within a high strength chain-lever connector **52** mounted to the left lever would pull this lever **14** upwards and the same opposite reaction would occur if the left pedal **36** was depressed. The transmission chain retractor spring **50** associated with the lever **15** or **14** being rotated upward would pull the transmission chain **33** forward so that the transmission chain can be repositioned to rotate its rear wheel sprocket member **34** forward for acceleration. Because each transmission chain **33** has limited movement, each chain has to be removed from the teeth of their member sprocket **34**, so that the rear wheel **26** may move backwards freely. This is done by lifting up the end portion reverse lever **30** close to the seat post cylinder. The reaction that would occur, based on the illustrations in figures 5 and 6, is that

the reverse cable **32** guided back towards the reverse lever **35** would be rotated upward. The protruding ends from the "V" shaped portion of the reverse lever **35** would then lift the transmission chains **33** off of their member sprocket's teeth. This would enable the rider to move the bicycle backwards.

Besides the improved conditions of the bicycle with the L.E.P.S., the bicycle would come standard with front breaks, back breaks and reflectors for night cycling.